

Aviation Safety Reporting System (ASRS) and it's Contribution to Human Factors Research

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AVIATION SAFETY REPORTING SYSTEM (ASRS)



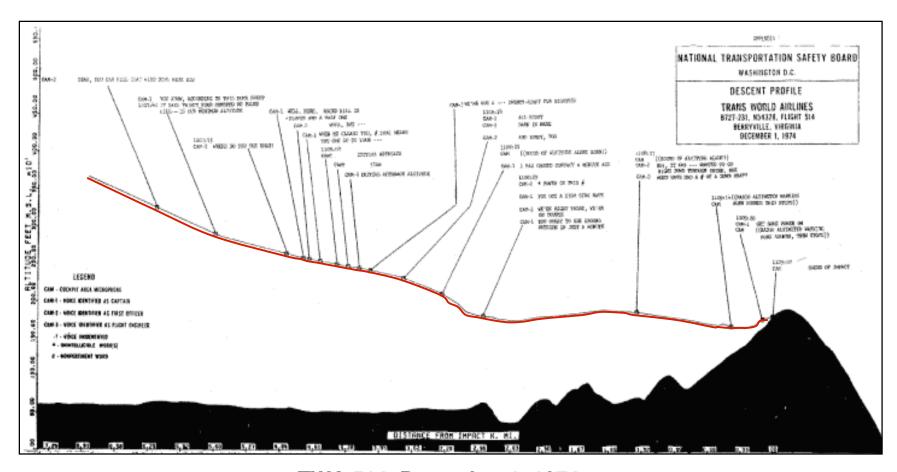




ASRS created following an aviation accident caused by a system's and human error



Aviation Tragedy Leads to Genesis of ASRS



TWA 514, December 1, 1974



Overview Summary



- ASRS established in 1976 as an independent, confidential, voluntary reporting system for aviation at NASA with FAA offering "immunity" to reporters.
 - One of the first lines of defense in identifying safety issues
 - NASA chosen as "Honest Broker"
 - Located at NASA Ames Research Center due to Aviation Human Factors expertise and research—it was recognized that approximately 70% of all accidents are human factors related.

ASRS database is a national asset of U.S. aviation safety data



ASRS GUIDING PRINCIPLES

VOLUNTARY PARTICIPATION

Reports voluntarily submitted concerning events related to safety for the purpose of understanding and learning

CONFIDENTIALITY PROTECTION

Protection of identity is provided by NASA through deidentification of persons, companies, and any other information

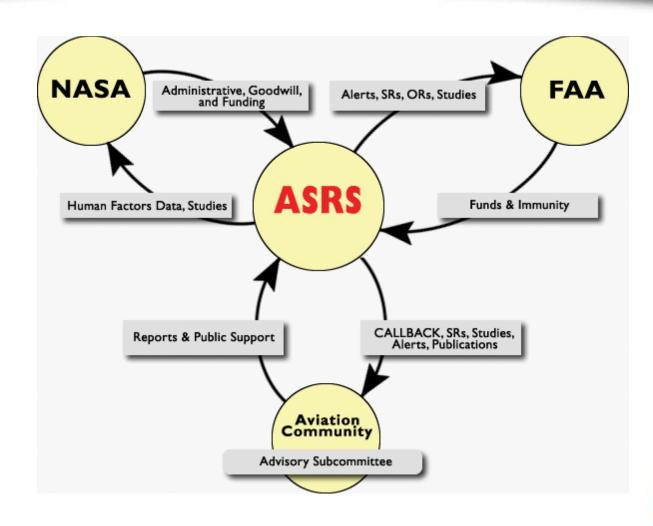
NON-PUNITIVE

"The FAA will not seek, and NASA will not release or make available to the FAA, any report filed with NASA under the ASRS or any other information that might reveal the identity of any party involved in an occurrence or incident reported."



ASRS Industry/Gov't Stakeholders











ASRS 28 Years of Operation





ASRS Report Intake



An Increase of 70% Since 1988

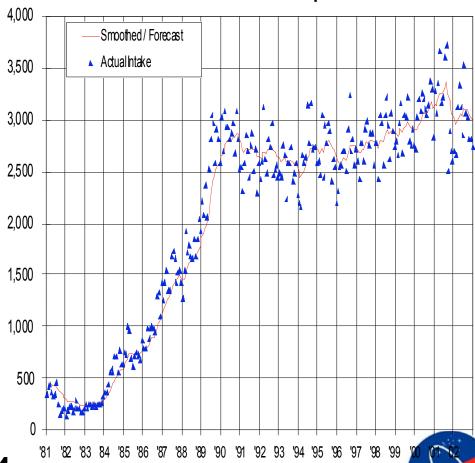
Averaging 2,900 Reports Per Month

145 per working day

Total 2003 Report Intake = 34,043 Reports

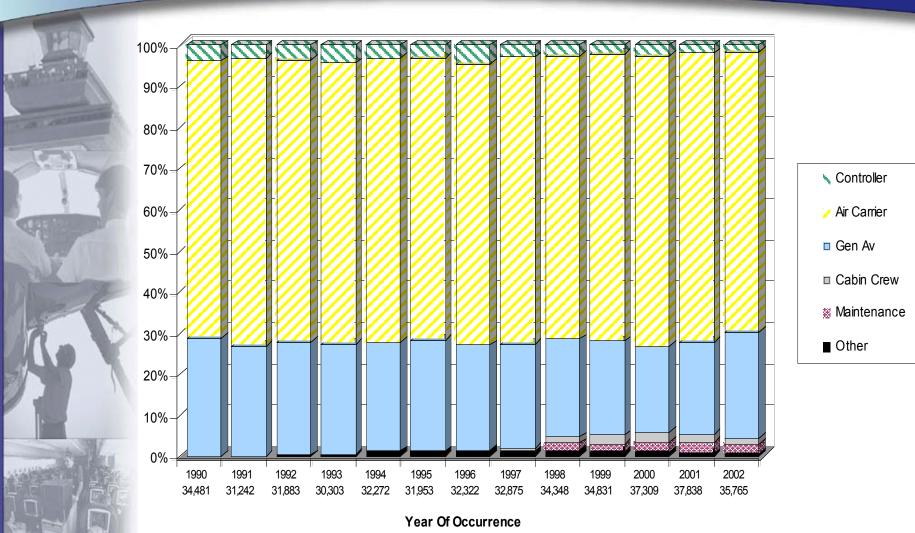
Intake projected to exceed 34,000 in 2004

Annual ASRS Report Intake



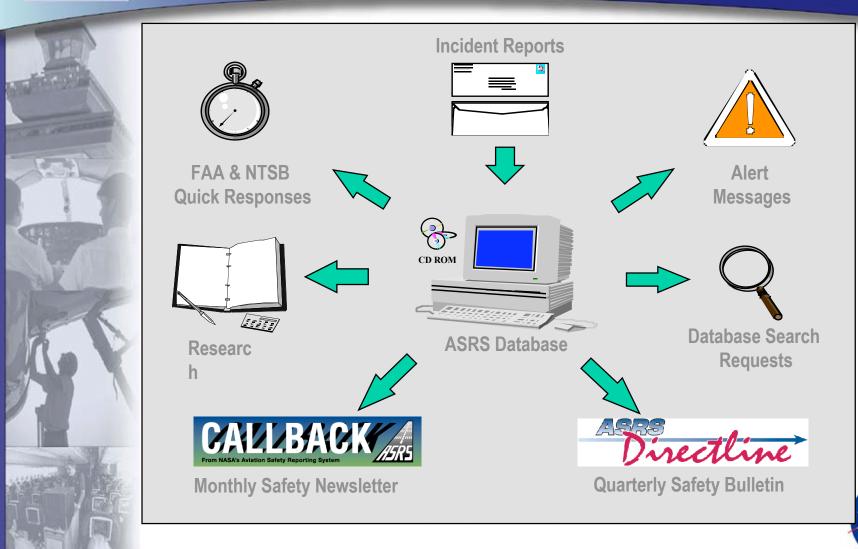


INCIDENT REPORTER DISTRIBUTION January 1990 - December 2002





ASRS PRODUCES A WIDE VARIETY OF PRODUCTS & SERVICES FOR THE AVIATION COMMUNITY





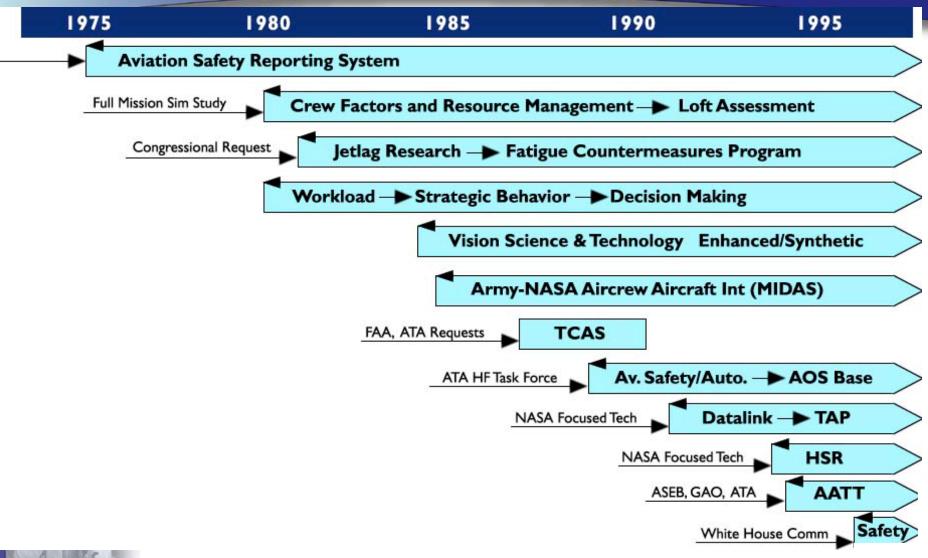


ASRS data used for Aviation Human Factor Research





ASRS Contributions to Human Factors Research at NASA Ames







Examples of ASRS data use



- Human Factors of Flight-Deck Checklists: The Normal Checklist, Asaf Degani and Earl Wiener, NASA CR 177549. Findings based on ASRS data.
- "Eliminating Pilot-Caused Altitude
 Deviations: A Human Factors Approach,"
 Robert L. Sumwalt, in Proceedings of the
 Sixth International Symposium on Aviation
 Psychology, The Ohio State University.
- On the Design of Flight Deck Procedures, Asaf Degani and Earl Wiener, NASA CR 177642. Findings based on ASRS data.



Examples (Con't)



- Additional NASA Human Factors Division Pl's use ASRS data
 - Barbara Kanki (Pilot-Controller Communication, Maintenance Human Factors)
 - Judith Orasanu (Decision Making, Crew Emergency Declaration)
 - Key Dismukes (Crew Pairing/Familiarity)
 - Michael McGreevy (Development of Patented Text Mining Tool - Perilog)
 - and others
- Used by universities, FAA and NTSB for numerous aviation safety and human factor topics



QUORUM Perilog What is it?

Information technology based on human factors

New text mining methods and software

Analyzes and models:

the structure of domains, situations, and concerns via corresponding structure of "unstructured" text

Provides new search tools for:

narratives such as incident and accident reports
any coherent text

any coherent sequences in which context is

meaningful





QUORUM Perilog ASRS/airline system overview

database researcher

queries



narratives, report IDs, models, vocabulary, phrases

QUORUM Perilog

keyterm-in-context search

flexible phrase search

search by example

phrase generation

contextual analysis

contextual modeling

relevance ranking

phrase discovery



incident narratives



NASA ASRS and FAA, Runway Safety Office Study on Airport Surface Movement Events



ASME Data Set



- The ASRS analyst team coded a total 531 ASME incidents that met the selection criteria.
- The 531 ASME incidents represented 26% of the total ASME incidents (2,029) in the ASRS database.
- The 531 ASME incidents represented less than 1% of the total number of database records.
- The ASRS database contains a total of 112,251 database records.





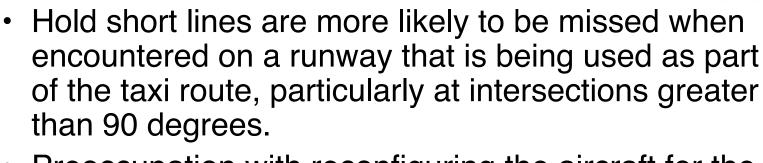
Summary of Operational Observations



- Significant number of ASMEs occur at locations already depicted on airport charts as "Hot Spots."
- Arrivals that are exiting a high-speed taxiway, between closely-spaced parallel runways, are prone to hold line incursions.
- Controllers fail to challenge incomplete or partially blocked readbacks, thus missing a wrong aircraft response.
- Pilots accept a non-response from ATC as confirmation of their clearance readbacks.
- ATC use of instructions to "follow (type aircraft) to Runway ____" can result in hazardous runway incursion incidents when the succeeding aircraft has lost sight of the preceding aircraft.



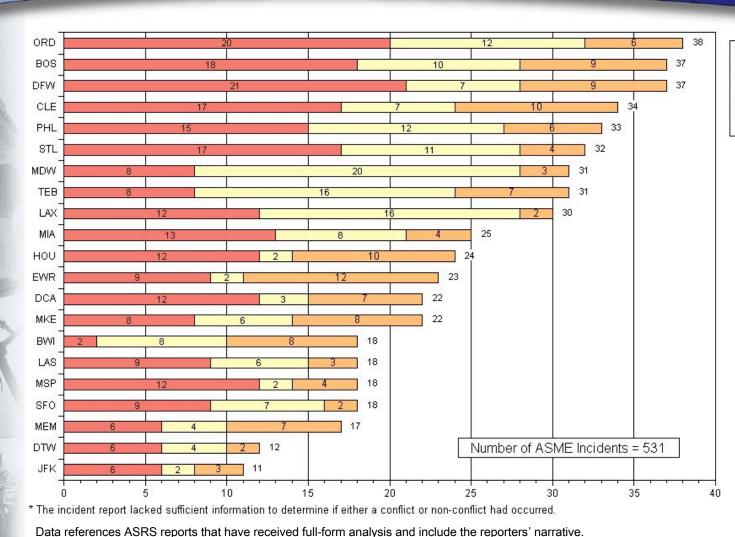
Summary of Operational Observations (cont'd)



- Preoccupation with reconfiguring the aircraft for the next trip contributes to incursions while taxiing in and during "close parallel runway" operations.
- Controllers at high volume airports tend to issue minimal taxi instructions.
- ATC issuance of multiple runway crossings at the same time can result in other aircraft assuming that they too, have been cleared to cross the runway.



ASME - Top 21 Airports



Conflict

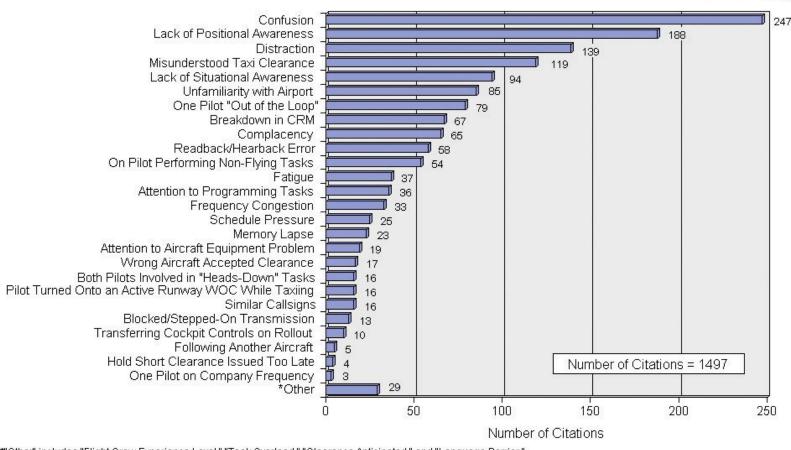
Non-Conflict

Incomplete Information*



ASME – Flight Crew Human Factors





*"Other" includes "Flight Crew Experience Level," "Task Overload," "Clearance Anticipated," and "Language Barrier."

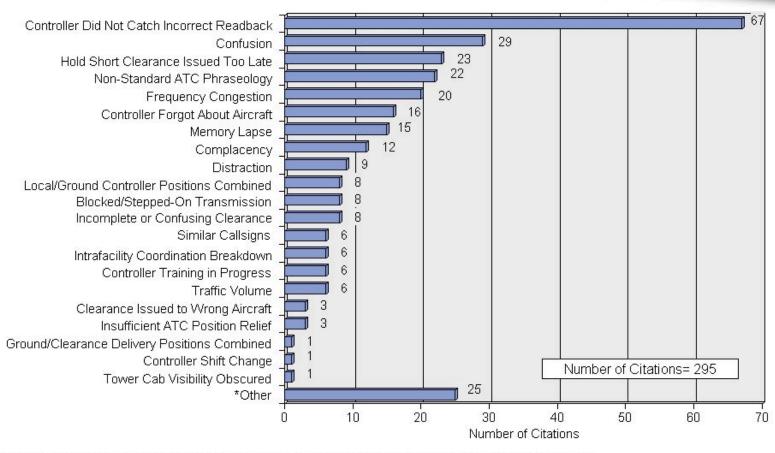
Categories are not mutually exclusive, therefore, a single incident may be coded by ASRS analysts as involving more than one citation. As an example, Pilots may have been involved in a "heads" down" task while turning onto an active runway without clearance.

Data references ASRS reports that have received full-form analysis and include the reporters' narrative.



ASME – Controller Human Factors





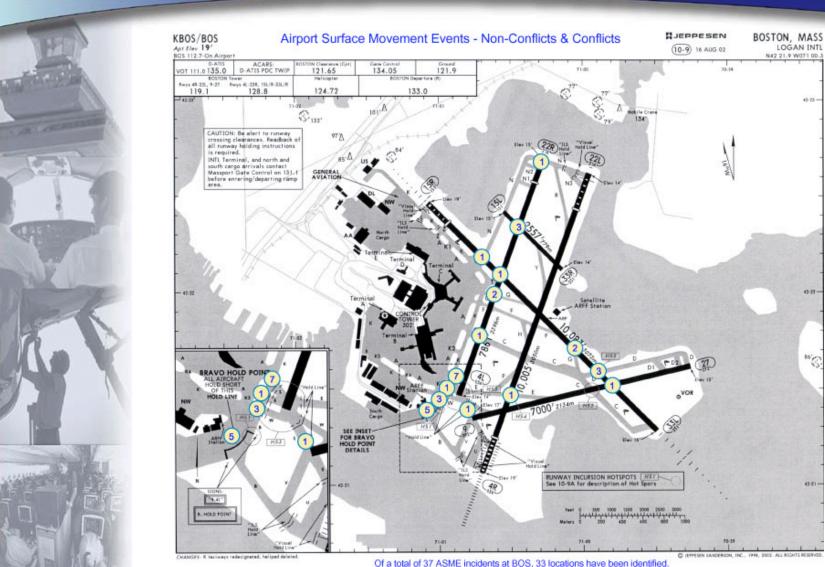
* "Other" includes "Aircraft on Separate Frequencies," "Speech Rate Too Fast," and "Too Many Ground Controller Crossing Requests."

Categories are not mutually exclusive, therefore, a single incident may be coded by ASRS analysts as involving more than one citation. As an exan may have been in progress when a clearance was issued to the wrong aircraft.

Data references ASRS reports that have received full-form analysis and include the reporters' narrative.



Boston (BOS)







Graphic Scenario - BOS

An Analysis of Airport Surface Movement Events

Aviation Safety Reporting System

Logan International Airport (BOS) Runway 27 B737-800/B737-200

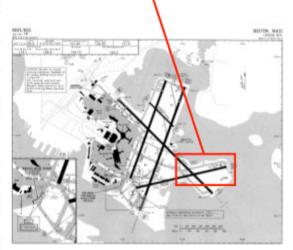
Sequence of Events (ACN 510140)

- B737-800, cleared to land on Runway 27, was informed of departing traffic on the "...crossing runway."
- B737-800 flight crew assumed that an aircraft rolling on Runway 22R was the referenced traffic.
- B737-200 was observed lifting off from Runway 15R prior to the intersection of Runway 27 and Runway 15R. The B737-800 was in their landing flare for Runway 27.
- BOS Tower instructs the B737-800 to go around.
- B737-800 rejected the go-around and elected to complete the landing.
- The Tower Supervisor informed the B737-800 Captain that the incident was caused by controller error.

Analyst Assessment

- There was a definite lack of coordination between the two Local Controllers.
- The Runway 27 Local Controller failed to issue the conflicting traffic or state the departure runway in use.
- The B737-800 crew made the correct decision in rejecting the go-around instructions.
- Executing a go-around by the B737-800, with the B737-200 rotating at the intersection, could have resulted in a near mid-air confliction.







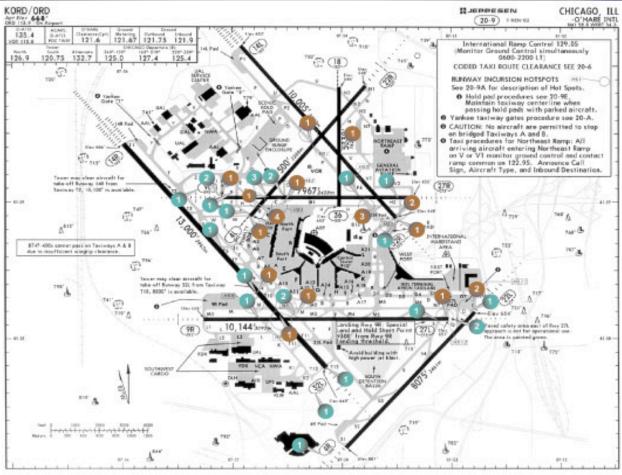


Chicago (ORD)



25 ASRS

Conflict Events

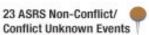




Of a Total of 25 ASMET Conflict Events at ORD, 22 Locations Have Been Identified.

Of a Total of 23 Non-Conflict/Conflict Unknown Events at ORD, 22 locations Have Been Identified.

Only the runway was identified for 3 ASMET Conflict Events.







Graphic Scenario - ORD

An Analysis of Airport Surface Movement Events

Aviation Safety Reporting System

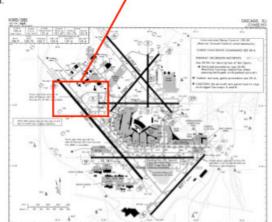
Chicago O'Hare International Airport (ORD) Runway 32L MD-80/B757

Sequence of events (ACN 515086)

- MD-80 was cleared for takeoff on Runway 32L at Taxiway T10.
- At 100-120 knots, MD-80 observed a B757 on short final for Runway 9L.
- MD-80 delayed takeoff rotation until clear of the B757's flight path.
- MD-80 rotated at 40 knots above VR after the B757 passed overhead at approximately 200 feet.
- The B757 Flight crew did not see the MD-80 until passing overhead.

Analyst's Assessment

- The B757 inbound was being given priority handling due to an on-board medical emergency.
- The B757 was issued a straight-in approach to Runway 9L which was counter to the westbound flow of arrivals and departures.
- The two Local Controllers failed to exchange conflicting traffic with each aircraft.
- The two aircraft were on separate Local Control frequencies and were unaware of each other's position.
- The Runway 32L Local Controller wanted a go-around issued to the B757. The Tower cab supervisor overruled that request.

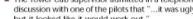


- The Tower Cab supervisor made that decision without knowing what action might be taken by the departing MD-80 flight crew.
- The Tower Cab supervisor admitted in a telephone but it looked like it would work out."





3ixler/Connell 10/04







ORD Narrative

IF WE HAD ROTATED NORMALLY WE WOULD HAVE COME VERY CLOSE TO A COLLISION. CALLBACK CONVERSATION WITH RPTR REVEALED THE FOLLOWING INFO: THE ACFT WERE BEING CONTROLLED BY SEPARATE ATCT LOCAL CTLRS ON SEPARATE FREQUENCIES. THE DEPARTING ACFT WAS HELD IN POS WAITING FOR WAKE TURB SEPARATION FROM A PRECEDING HEAVY ACFT DEP. NEITHER ACFT WAS ADVISED OF THE OTHER. THE ARRIVING ACFT WAS GIVEN HIS LNDG CLRNC APPROX 10 MILES OUT ON FINAL. HE WAS RECEIVING PRIORITY HANDLING DUE TO A MEDICAL EMER. HIS RWY ASSIGNMENT WAS FOR EXPEDITED HANDLING TO HIS TERMINAL. IT WAS NOT IN USE BY OTHER LNDG TFC. THERE WAS NO OPERATIONAL REASON WITH THE ACFT THAT WOULD PREVENT HIM FROM EXECUTING GAR. DURING AFTER THE FACT CONFERENCE WITH TWR SUPERVISION BY ONE OF THE CREWS, IT WAS RPTED THAT THE CTLR OF THE TKOF RWY CALLED FOR THE OTHER CTLR TO SEND THE LNDG ACFT AROUND. HIS REQUEST WAS DENIED/OVERRIDDEN BY TWR SUPERVISION WHO THOUGHT IT 'LOOKS BAD BUT WOULD WORK OUT.' WHEN THE OTHER CREW CONFERRED WITH TWR THEY WERE TOLD THAT 'IT WAS UGLY BUT IT LOOKED LIKE IT WOULD WORK OUT.'

SUPPLEMENTAL INFO FROM ACN 515192: ON SHORT FINAL TO 9L AN MD80 PASSED APPROX UNDER US AS HE WAS MAKING HIS TKOF FROM 32L. WE WERE GIVEN ATC PRIORITY HANDLING INTO ORD BECAUSE OF A MEDICAL EMER. THE TIMING OF THE 32L DEP WAS A LITTLE OFF WHICH RESULTED IN THE MD80 BEING APPROX UNDER OUR FLT PATH WHILE ON HIS TKOF ROLE. AGGRESSIVE CONTROLLING MIGHT HAVE BEEN OR MISCOMMUNICATION BTWN TWR CTLRS. I DON'T FEEL IT WAS UNSAFE, BUT A LITTLE CLOSER THAN IT SHOULD HAVE BEEN. I WAS THE CAPT OF THE FLT AND THE PLT FLYING. I DON'T BELIEVE THAT EITHER I, THE FO, OR THE FAA INSPECTOR ON THE JUMP SEAT SAW THE MD80 UNTIL WE WERE BASICALLY PASSING OVER HIM. I DON'T KNOW IF THE OTHER AIRPLANE SAW US OR NOT. NOTHING WAS SAID ON THE TWR FREQ.







ASRS and Airline Safety Action Programs (ASAP)





ASAP Report Submission Update



Receiving ASAP paper reports from 8 Airlines with 10 ASAP programs. Others may be sending on standard form which would be undetected as ASAP by ASRS.

Digital Data Transmission Process available between ASAP and ASRS.

Use of state-of-art SSH Secure Shell and Private Key technology Three ASAP airlines transmitting data electronically

Technical Meetings of ASAP Managers and ASRS held periodically to discuss the mechanisms of the ASAP ASRS Submission. Interested airline contacts = 22.





ASRS - Model for Other Operational Systems

There has been growing interest from a variety of disciplines desiring the safety benefits realized in aviation.

Numerous organizations
have requested
assistance from the ASRS
in creating reporting
systems designed to help
them understand and
learn about their own
systems.



MEDICAL



MARITIME





HIGHWAY

INTERNATIONAL CONFIDENTIAL AVIATION SAFETY SYSTEMS (ICASS)

Canada SECURITAS

United States ASRS United Kingdom CHIRP

Russia VASRP

Germany EUCARE

South Korea
KAIRS
Taiwan
TACARE

Current Member

Former Member

New Members: Japan, China, Singapore South Africa

Australia CAIRS

New Zealand ICARUS





CROSS-INDUSTRY APPLICATION

Medicine





Medical Performance Factors





VA Staff Invited to Participate

Any VA staff or personnel working in VA facilities are invited to submit voluntary reports concerning medical safety

- Physicians
- Nurses
- Laboratory
- Radiology
- Pharmacy
- Rehabilitation
- Dietitians
- Support Staff
- Others









CROSS-INDUSTRY APPLICATION

Security



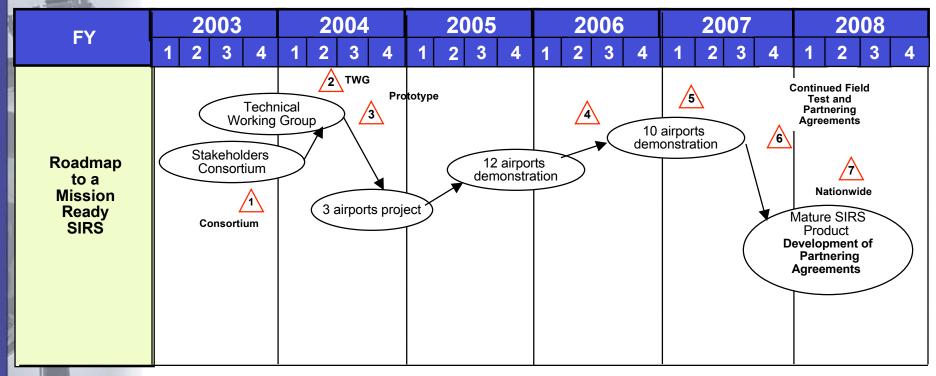


NASA Security Incident Reporting System (SIRS)

- ASRS has received security related reports as part of all reporting, but following Sept 11 this type of report increased significantly.
 - NASA funded the ASRS to perform an extensive evaluation of these security related reports received and initiate a structured callback study interviews for any new report to the ASRS.
- As a result of this work in '01- 02, the NASA Aviation Safety and Security Program (AvSSP) is providing the funding for a new, separate, prototype system for security incident reporting under the provisions established for voluntary, confidential, non-punitive reporting.
- Work is progressing to establish a SIRS prototype during the next several years. Collaboration with TSA, Department of Homeland Security, and FAA is included in this planning

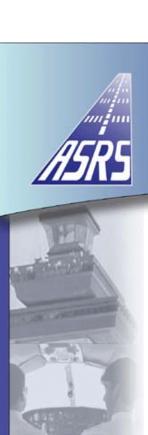


Project Roadmap









CONCLUSIONS





Confidential Reporting Can Provide "The First Line of Defense"



- A confidential reporting system can hear about and identify safety events and issues for <u>early</u> <u>warning</u> of potential serious occurrences . . .
- ... from the "human element" the people interacting directly with the system
- . . . who describe events having face validity honest, accurate, professional, introspective,
- ... from the reporter's unique point of view

ASRS Model is Well-Established, Proven, and *Trusted*





Confidential Reporting Can Provide "The Big Picture"

- Most other data sources lack the ability to capture the information that this type of reporting receives.
 - Reporting from a broad population of system users
 - Reporting covers the full spectrum of safety concerns
- Reporting system can target specific populations for special study and expanded information gathering
 - Structured Callback Studies
 - Routine telephone callback
 - Special Studies





SUMMARY

WHY CONFIDENTIAL REPORTING WORKS

- When organizations want to learn more about the occurrence of events, the best approach is simply to ask those involved.
- People are generally willing to share their knowledge if they are assured:
 - Their identities will remain protected
 - There is no disciplinary or legal consequences
- A properly constructed confidential, voluntary, non-punitive reporting system can be used by any person to safely share information



SUMMARY

WHY CONFIDENTIAL REPORTING WORKS (con't)

- Confidential reporting systems have the means to answer the question why - why a system failed, why a human erred
- Incident/event data is complementary to the data gathered by other monitoring systems and risk management efforts



